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# Share of manufacturing in India's GDP: Stagnant or increasing?

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ABSTRACT

Contrary to a widely held impression that the share of manufacturing in India's GDP has long stagnated, the paper claims that it has increased significantly. Measured at the prices of different goods and services prevailing in 2004-05, and deflation applied separately with input prices as well as output prices to account for differential input price trends, the GDP share of manufacturing has increased during the post-reform period from about 17 per cent in 1993-94 to about 32 per cent in 2018-19. The paper notes that the concept of real share in GDP relates to the volume effect and represents the change in the share of the volume of manufacturing activity out of the volume of all economic activities in the Indian economy. Some explanation is provided for the apparent stagnancy of the share of manufacturing in India's GDP at current prices.

## 1. Impression of a stagnant manufacturing share in GDP

There is a widely held impression that the share of manufacturing in India's GDP has been stagnant for a long time. The basis for this impression is that in India's national accounts data,[1] the share of manufacturing in India's aggregate gross value added (GVA), both at current prices and at constant (2011-12) prices, does not exhibit any upward trend in the post-reform period (see Fig. 1).

The prime goal of the *National Manufacturing Policy*, 2011, was to raise the share of manufacturing in India's GDP by about ten percentage points between 2012 and 2022, making manufacturing GDP reach about a quarter of India's aggregate GDP by 2022. This goal of enhancing the manufacturing share of GDP to 25 per cent remains unrealized if one considers the GVA of manufacturing and the aggregate economy in national accounts data.

Because the GDP share of manufacturing has stagnated and that of services has increased markedly, it has often been argued that India's development experience has been different from the nature of structural transformation that has been observed historically. In the process of development, the share of industry in GDP is expected to increase first, and then this will be followed by an increase in the GDP share of services. However, in the case of India, the services sector has bypassed the industrial sector (see, for example, Soni and Bala Subrahmanya, 2020, who make this observation). Similarly, Basu and Veeramani (2021) point out that a distinctive feature of India's structural transformation is that the share of manufacturing in GDP has been nearly constant at about 20 per cent and the share of services in GDP has been on the rise (from 43 per cent in 1980 to 63 per cent in 2016). Such comments about the nature of structural change in the Indian economy have been made in the past by several other scholars.[2]

In this paper, we closely examine the trends in the share of manufacturing in aggregate GVA of the Indian economy. The primary data source used for the analysis is the India KLEMS database available on the website of the Reserve Bank of India[3] (discussed briefly in Annexure-A). For some analyses, data have been drawn from the *Annual Survey of Industries* (ASI) (National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India), which covers the organized manufacturing sector in India.

## 2. Measuring sectoral shares in GDP, current or constant prices

Structural change is recurrently analyzed by examining the changes in sectoral shares occurring over time in aggregate nominal GVA, i.e., the current price GVA. Some studies have used the sectoral shares in

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[2] Ghose (2015, p.61) writes that the peculiarities of India's development experience lies in the marginalization of manufacturing in the growth process by the rise of the services sector. For a discussion on the structural change in India, see Ghose (2021), among several others.

[3] https://www.rbi.org.in/Scripts/KLEMS.aspx. At the time of writing the paper, the dataset covered the period up to 2019-20.

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both nominal and real aggregate GVA (see, for example, Herrendorf et al., 2013; Haraguchi et al., 2016; Rodrik, 2015) for analyzing structural change. Our contention in the paper is that for a good understanding of the process of structural transformation in the Indian economy, it is not sufficient to consider the sectoral shares in aggregate GVA at current prices, but one also needs to consider the sectoral shares in GVA at constant prices.

Constant price GVA may be derived by dividing nominal GVA of an industry by the output price index of the industry. This is known as the single deflation method. Alternatively, the output of the industry may be deflated by the output price index and intermediate inputs may be deflated by the intermediate input price index, and then, the deflated value of intermediate inputs may be subtracted from the deflated value of output to obtain GVA at constant prices. This is known as the double deflation method. The central point made in the paper is that for analyzing the structural changes in India, one needs to consider constant price GVA data which are based on the double deflation procedure rather than the single deflation procedure.

It is necessary to counter here an argument that for examining structural change in an economy, GVA data at current prices are good enough or such data are conceptually better than GVA data at constant prices since current price data reflect the value placed by the market on goods and services produced by different sectors of the economy or that current price GVA data are aligned to factor incomes.[4] This point needs emphasis because some studies on structural change in the Indian economy have considered the sectoral shares in aggregate GVA (or GDP) at current prices (for example, Dutta et al., 2015; Erumban, et al., 2019).

It needs to be emphasized that often technological advance is at the root of structural changes in an economy, and technological advance may be associated with a significant fall in the prices of the products supplied. Thus, if sectoral shares are measured by using data on nominal value added, the structural change driven by technological advance may not be captured properly by the data.[5] An analysis of structural change based on current price GVA data may fail to capture adequately the rapid growth attained by some industries, which are experiencing a fall in their output prices concurrently (whereas other industries are experiencing an increase in their output prices). To substantiate this statement, two examples from Indian economy are given below.

Consider the share of post and telecommunications in the aggregate GVA of market services in India. It is known that mobile telephony and access to internet services have revolutionized the Indian economy and society.[6] It would be interesting to find out whether this is reflected in the share of the post and telecommunications sector (which includes mobile services, and internet services) in the aggregate GVA of market services. This is shown in Table 1 (based on India KLEMS data). The shares at current prices and the 1999-2000 prices are both shown for select years.

It will be noticed in Table 1 that the relative GVA share of the post and telecommunications sector, which is dominated by mobile services, voice and data, and internet services, along with the fast-increasing courier services in the country, has declined over time, and one may accordingly conclude that these developments have made no significant difference to the Indian economy. Such an inference will be grossly incorrect. The share at constant (1999-2000) prices, which shows a rise, picks up the critical role that mobile and internet services have played in the Indian economy. This difference in interpretation arises because of the divergent movement in the 'price' and 'volume' dimensions of value addition in mobile and internet services and courier services.

The point made above about telecommunication services also applies to the manufacturing of information technology and telecommunication equipment (hereafter IT and telecom equipment). The real prices of IT and telecom equipment have fallen significantly over time. In India's *National Accounts Statistics*, the wholesale price indices are used for deflating the nominal GVA of manufacturing industries. To our knowledge, the wholesale price indices for computers and telecommunication equipment in India are not quality adjusted (which is known as the Hedonic quality-adjusted price index). According to the PPI (producer price index) series of the U.S. Department of Labor, the price index for electronic computers and computer equipment for Nov-Dec 2019 was about 26 (base 12/1998), and the price index for communication equipment manufacturing was 93 (base 12/ 1985). According to India's national accounts data, the implicit deflator for the Manufacture of computer and peripheral equipment and the Manufacture of communication equipment increased by about 23 per cent between 2011-12 and 2019-20. This hike matches the increase in the Wholesale price index for products of the two industries.

For studying the trends in the share of the IT and telecom equipment industry in the manufacturing sector GVA at current and constant prices, a quality-adjusted deflator for ICT (information and communication technology) goods has been used in this study, deviating from the price index that underly India's national accounts.[7] In the India KLEMS database, IT and telecom equipment is not a separate industry. It is a part of the Electrical and Optical Equipment industry. Thus, to examine the GVA share of the IT and telecom equipment industry, it has been carved out from the Electrical and Optical Equipment industry.

Table 2 shows the IT and telecom equipment industry share out of aggregate GVA of Indian manufacturing from 1993-94 to 2019-20.[8] The share at current prices and the 1999-2000 prices are shown. The table underscores the need to consider GVA at constant prices to study structural change. When measured at current prices, the IT and telecom equipment industry had a low and declining share in aggregate GVA of manufacturing, and at the 1999-2000 prices, it had a significantly rising share of manufacturing sector GVA. Interestingly, by 2019-20, the IT and telecom equipment industry accounted for nearly one-quarter of

[4] Herrendorf et al. (2013) examine EU KLEMS data for 1970-2007 and conclude that inter-temporal changes in the shares of broad sectors in nominal or real value-added show similar patterns qualitatively. This might give one the impression that it does not matter whether the real GVA data or nominal GVA data are used in a study of structural change.

[5] In this context, attention may be drawn to the producer theory in microeconomics as applied in econometric studies (see Jorgenson, 2000). Given a production function, Q=f(L, K, X, t) where Q is output, L labour input, K capital input, X intermediate inputs and t time, the rate of technical progress is given by $\partial Q/\partial t$. Dual price function is the dual to the production function derived under optimizing behaviour of the producer, and may be written as $P_Q = g(P_L, P_K, P_X, t)$ where $P_Q$, $P_L$, $P_K$, and $P_X$ are the prices of output, labour input, capital input, and intermediate input, respectively (see Jin and Jorgenson, 2010). The rate of technical progress that may be derived from the price function is $-\partial P_Q/\partial t$. The interpretation of this expression is that given input prices, technical advance causes output price to fall. The implication is that in a developing country undergoing rapid industrialization accompanied by significant technical advance in the manufacturing sector, the prices of manufactured products are likely to fall absolutely, or at least relatively, and the national accounts data at current prices will usually not correctly measure the structural change in the economy driven by technical change.

[6] Gordon and Gupta (2004) list communication services as one of the fast-growing sub-sectors within services.

[7] The deflator used for deflating GVA is the ICT (information and communication technology) investment deflator series for India. It was prepared by Dr. Abdul Azeez Erumban. We are grateful to him for providing us this series for the present study. For details, see (de Vries and Erumban, 2022). It makes use of ICT data from Byrne and Corrado (2017). For the measurement of ICT price, a quality-adjusted price index is needed. The use of a single harmonized deflator across countries was widely advocated and used (Timmer and van Ark, 2005; Schreyer, 2002). The deflator used in the study is derived from ICT price data for the US.

[8] Gross output and gross value-added data for the Manufacture of computer and peripheral equipment and the Manufacture of communication equipment are available for 2011-12 onward in the National Accounts statistics. The series have been extrapolated backward till 1993-94 using ASI data.

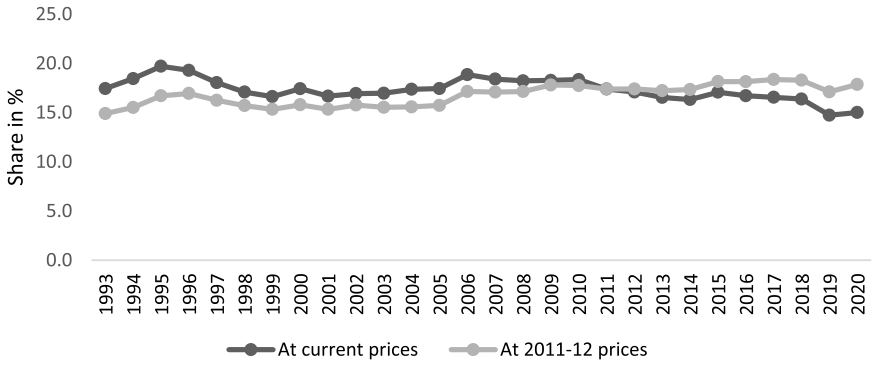


**Fig. 1.** Share of manufacturing in aggregate gross value added, India, 1993-94 to 2020-21.
Source: Authors' computations based on *National Accounts Statistics* (2011-12 base).

**Table 1**
Share of post and telecommunications in total GVA of market services (%).

| | 1993-94 | 1999-2000 | 2004-05 | 2009-10 | 2015-16 | 2019-20 |
|---|---|---|---|---|---|---|
| At Current prices | 7.8 | 7.8 | 7.4 | 7.1 | 6.0 | 4.8 |
| At 1999-2000 prices | 5.4 | 7.8 | 13.2 | 12.7 | 12.4 | 10.2 |

Source: Author's computations based on India KLEMS database (version 2022)

**Table 2**
Share of information technology and telecommunication equipment industry in GVA of manufacturing, 1993-94 to 2019-20 (%).

| | 1993-94 | 1999-2000 | 2004-05 | 2009-10 | 2015-16 | 2019-20 |
|---|---|---|---|---|---|---|
| At Current prices | 1.4 | 0.8 | 0.8 | 1.0 | 1.0 | 0.9 |
| At 1999-2000 prices | 0.3 | 0.8 | 1.5 | 5.4 | 12.9 | 22.3 |

Source: Authors' computations based mainly on India KLEMS database, 2022

manufacturing GVA at 1999-2000 prices.

Before concluding this section, attention may be drawn here to the fact that the value addition done by an industry has two dimensions – a volume dimension and a price dimension. If the volume dimension grows but the price dimension falls, the share in current prices may not increase or even fall. Analysis of structural change is (or should be) principally concerned with the volume effect. Thus, measuring value added at constant prices is important for studying structural change, which is the key message from Tables 1 and 2.

## 3. Measuring growth in real GVA of manufacturing by the double-deflation procedure

While we have argued above that for assessing structural change in the Indian economy, the sectoral GVA shares at constant prices should be studied rather than sectoral GVA shares at current prices, it will be noticed in Fig. 1 that the share of manufacturing in India's aggregate GVA (or GDP) has been flat both at current prices and at constant prices. The crucial question to be asked is, constant prices of what? It is to this question that we now turn.

Fig. D.1 in Annex-D presents the wholesale price indices (base 2004-05=100) of manufactured products and certain categories of intermediate inputs used in manufacturing in India for 2004-05 to 2019-20. It is seen in the figure that the increase in the prices of intermediate inputs exceeded that in product prices. While the price index for manufactured products was 165 in 2019-20 (2004-05=100), the price index for minerals was 473. The prices of agricultural raw material used in manufacturing increased between 2004-05 and 2019-20 much more than the increase in manufactured product prices. The share of manufacturing in aggregate GVA in India measured at constant prices shown in Fig. 1 involves adjusting for prices changes in manufactured products and does not take into account the fact that certain intermediate inputs used in manufacturing underwent a much larger hike in prices. This brings us to the discussion on double deflation and the assertion that the trends in the manufacturing share on India's GDP can be rightly assessed only if the double deflation procedure is adopted for correcting for prices change.

As argued repeatedly above, for assessing real GVA growth in different sectors of the economy, there is a methodological advantage in applying the double deflation procedure to make corrections for price changes over time. The need for double deflation arises because an industry's output and intermediate input prices need not, and often do not, rise and fall by the same percentage. When the single deflation procedure is applied to value-added, then implicitly, the output price index is used for deflating output and intermediate inputs, which is incorrect. An example that may be given here relevant to the point under discussion relates to the price of energy. The rate of increase in prices of energy items say natural gas or coal, or electricity, bought by an industrial firm is often not proportional to the price movement of the firm's output. Thus, if the product price index is used to deflate the energy inputs bought (which is what the single deflation procedure does), the measured real value added will not be correct. The double deflation procedure may thus be regarded as highly desirable for preparing national accounts, and the national accounts of several advanced countries, including Australia, Canada, France, Germany, Japan, the Netherlands, and the U.S., use double deflation (see Alexander et al. 2017). Even some emerging economies, Brazil, Korea, and Mexico, use double deflation. India's national accounts are based on single deflation (except for agriculture, for which the double deflation procedure is applied).

For the core analysis presented in the paper, the India KLEMS database is used with some modifications. One of them has been mentioned above – separating the IT and telecom equipment industry and using a different deflator for this industry. The other change made is that the output deflator for the coke and petroleum products industry has been modified by taking a weighted average of the domestic wholesale price index and the export unit value index applied respectively to the domestic sales and export components. The deflator in the India KLEMS database is based on the domestic wholesale prices of petroleum products. A combination of domestic and export prices is advisable since a significant part of the output is exported (about one-quarter by the end of the 2010s).[9]

Using the India KLEMS database (with modifications), double-deflated GVA[10] has been computed for the manufacturing sector and the aggregate economy at 1999-2000, 2004-05, and 2011-12 prices, yielding the share of manufacturing in aggregate GVA at constant prices. The share of manufacturing GVA in aggregate GVA shows a clear upward trend (see Fig. 2). All three series show an increase over time. Of the three series, the one at the 2004-05 prices is the preferred one since it is based on the prices of a year which is the middle of the study period. Considering that series, the share of manufacturing in aggregate GVA of the Indian economy was 17 per cent in 1993-94 (hereafter written as 1993) and more than 30 per cent in 2018-19 (2018). This should be contrasted with the pattern seen in Fig. 1. The finding of an upward trend in the share of manufacturing in aggregate GVA should be juxtaposed against a widely held impression of a stagnant manufacturing share in GDP in India and a belief that an important step in the process of development, as per the historical experience, is being missed in India when services have bypassed industry.

It is interesting to observe in Fig. 2 that in the period 1993 to 2003, there was no increase in the share of manufacturing in aggregate GVA (at 1999-2000, 2004-05, or 2011-12 prices), and there has been an increase in this share in the high growth phase of the Indian economy, 2003-2007, and in the period post the global financial crisis (GFC). Between 2003 and 2018, the share of manufacturing in aggregate real GVA (after applying double deflation) increased by about 15 percentage points (measured at 2004-05 prices).

When double-deflated GVA is computed at 1999-2000 or 2004-05 prices, a rise is seen in the manufacturing share in aggregate real GVA, and the share in 2018 is found to be more than 30 per cent. When the computation of double-deflated GVA is done at 2011-12 prices (as in the current series on national accounts and in the India KLEMS data), the share of manufacturing in aggregate GVA in 2018 is found to be around 20 per cent. However, even in that case, there is a substantial increase in the manufacturing sector share in aggregate real GVA by about 14 percentage points between 2003 and 2018. This finding raises a question: Is it right to use phrases like 'manufacturing share in GDP has stagnated' or 'manufacturing has been bypassed by services' to describe the development experience in India in the post-reform period?

Since the share of manufacturing in GDP measured at constant prices is conditional on the base year chosen for prices, what does the figure of a 30% share of manufacturing in GDP in 2018-19 at 2004-05 prices mean? This is explained further later in the paper.

## 4. Tornqvist index of real GVA growth in manufacturing

One limitation of the conventional double-deflation procedure (which has been applied for the computations shown in Fig. 2) is that the growth rate in real GVA is not independent of the base year of price indices (see Goldar, 2002).[11] One way of addressing this issue is to apply the Tornqvist index.[12] The Tornqvist index of real GVA growth may be obtained by using the following equation:

$$\overline{V} = [\overline{Q} - (1 - \overline{S}_V)\,\overline{X}]/\overline{S}_V \ldots \quad (1)$$

In this equation, $\overline{Q}$ is the growth rate in the deflated value of gross output, $\overline{X}$ is the growth rate in deflated intermediate inputs, and $S_V$ is the share of gross value added in the value of gross output. The bar over S in the above equation means that an average of the current year ($S_{V(t)}$) and the previous year ($S_{V(t-1)}$) has to be taken.

The above equation arises from the following identity (see Jorgenson et al., 2005, p. 374):

$$\overline{Q} = [\overline{S}_V\ \overline{V} + (1 - \overline{S}_V)\,\overline{X}] \ldots \quad (2)$$

which is interpreted as showing that the growth in real gross output (Δ lnQ) is a weighted aggregation of growth in real value added (Δ lnV) and real value of intermediate inputs (Δ lnX).

Having obtained the Tornqvist index of real GVA growth for individual industries, these can be aggregated to the sector level, e.g., the manufacturing sector, or to the economy level by applying shares of different industries in nominal value added (denoted by w), as explained in the following equation (subscript M is for manufacturing):

$$\overline{V}_M = \sum_{i \in M} \overline{w}_i \overline{V}_i \ldots \quad (3)$$

Applying Eq. (1) to the India KLEMS data in respect of manufacturing industries (with aforementioned modifications to the data), it is found that the double deflated GVA growth in manufacturing was 5.2 per cent per annum during 1993-2002 and 10.7 per cent per annum during 2003-2019.[13] This accelerated growth rate during 2003-2019 substantially exceeded the double-deflated GVA growth in the economy, causing the share of manufacturing to increase.

The computation of the Tornqvist index makes it possible to compute the contribution of different industries to the aggregate level manufacturing sector real GVA growth (see eq. (3); for an example of such an analysis, see Jorengson et al., 2005, Fig. 8.2; such decomposition for manufacturing sector growth for 2003-2019 is shown in Fig. D.2 in Annex-D). The analysis reveals that the increase in growth rate between 1993-2002 and 2003-2019 was primarily contributed by the Coke and petroleum products industry; it contributed about 65 per cent of the growth acceleration. The other industries that made a significant contribution to growth acceleration are (a) Textiles, Textile Products, Leather and Footwear (8.6 per cent), (b) Non-electrical machinery (7.1 per cent), and (c) Basic metals and fabricated metal products (4.9 per

[9] The main findings of this section do not change if this change in output deflator for petroleum refining is not done.

[10] This is obtained as the deflated value of gross output minus the deflated value of intermediate inputs. For discussion on double discussion in the context of Indian manufacturing, see Rajakumar and Shetty (2015).

[11] Another issue is that when double deflation is applied at a disaggregated level to specific industries, the deflated value added may become negative for some years which is hard to interpret.

[12] The conventional method of computing double-deflate GVA is based on the Laspeyres or UN double-deflation index, whereas in applying the Torqvist index, the Divisia index is applied (since the Tornqvist index is a discrete approximation to the Divisia index) with its desirable properties. See Cassing (1996).

[13] Applying Eq. (1) to the data of the *Annual Survey of Industries* at the two-digit industry level and then aggregating across industries using value-added weights, it is found that the average annual growth rate in real GVA (Tornqvist index) of Indian organized manufacturing during 1997-98 to 2007-08 was about 11 per cent per annum and that during 2008-09 to 2018-19 was about 9.4 per cent per annum. For these computations, the series at the two-digit industry level prepared by the Economic and Political Weekly Research Foundation based on ASI data have been used. Thus, during the 22-year period 1997-98 to 2018-19, the average growth rate in real GVA of organized manufacturing was about 10 per cent per annum, which was about 3.5 percentage points above the growth rate in real aggregate GVA of the economy (estimate of the aggregate economy real GVA growth rate computed by applying the Tornqvist index presented in Krishna et al., 2022).

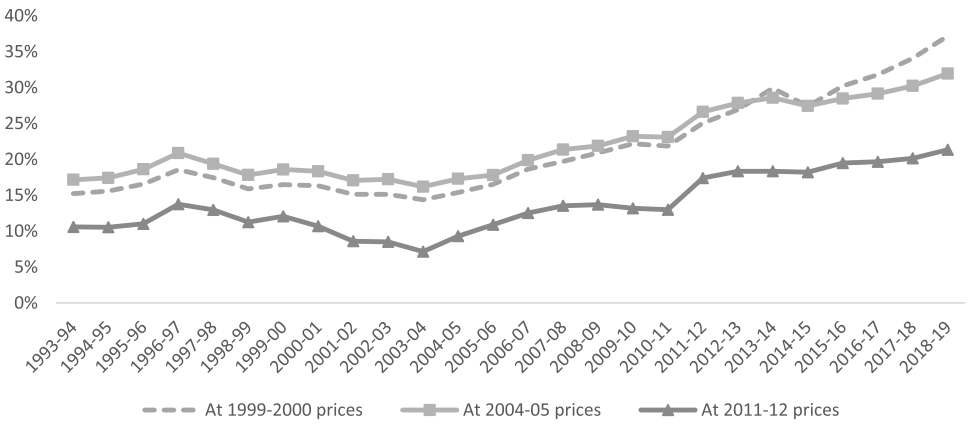


**Fig. 2.** Share of manufacturing in aggregate GVA at alternate prices, 1999-2000, 2004-05 and 2011-12 prices, double deflation procedure.
Source: Author's computations based mainly on India KLEMS database (version 2022).

cent). While the IT and telecom equipment industry attained a very high growth rate, its contribution to the aggregate level real GVA growth is small because the aggregation of industry-level growth is done on the basis of their relative shares in nominal GVA (i.e., *w* in Eq. (3)) and the relative share of this industry in aggregate nominal GVA is very small.

## 5. Interpreting the hike in the real GVA share of manufacturing

Gruver et al. (1993) have examined how far the measures of change in nominal value-added sectoral shares in GDP represent real changes in sectoral activity as against systematic changes in relative prices. From the econometric analysis undertaken by them (grounded in a theoretical analysis), they find that the elasticity of the nominal GDP share of manufacturing with respect to per capita income (an indicator of the level of development) is much less than the elasticity of the real share (0.045 as against 0.36) in the low-income countries, which also hold for the middle-income countries. The implication is that the increases in the real share of manufacturing in GDP are understated by the increases in nominal share in GDP in low-income and middle-income countries. This is, in essence, the point being made above: the changes in the manufacturing share in nominal GDP in India (almost none) do not capture the 'true' structural change that has been taking place.

To return to the price and volume dimension of the value addition done by industry, Gruver et al. (1993) point out that in the process of development, there is a negative effect on the factor rewards to primary factors, labour and capital, engaged in manufacturing. They test this empirically and find a significant negative effect. This is the reason why manufacturing share in nominal GDP understates the structural change taking place in favour of manufacturing.

Let us now try to connect these points to the issue at hand. In 2004-05, there were economic activities taking place in different sectors of the Indian economy. The markets in India valued these activities in manufacturing at 17% out of the aggregate value of all economic activities in the Indian economy. Over time, economic activities grew in different sectors of the economy, and changes took place in the valuation placed on different activities by the markets. By 2018, the volume of activities in manufacturing reached over 30% of the aggregate volume of different economic activities in India when this is judged on the basis of the prices prevailing in 2004-05. This is the meaning of the figure of 30% depicted in Fig. 2. But, the markets placed, in 2018, a relatively lower value on the activities in manufacturing with the consequence that, measured at the current prices (reflecting the current valuation of the activities in terms of the factor rewards to primary inputs in manufacturing), the value of manufacturing in the total value of all economic activities in the country was only about 16.4%, lower than that in 2004-05.

## 6. Explaining the observed stagnancy in the share of manufacturing in aggregate GVA

From the analysis above, it is evident that the volume of manufacturing activity as a proportion of the volume of all economic activities in the Indian economy has increased over time. However, when valued at current prices or when price corrections are done by applying the single deflation procedure, the value share of manufacturing activities out of the total value generated by all economic activities in the Indian economy has not increased. How does one explain this phenomenon? This issue is addressed in two steps. First, some points are made pertaining to the reasons why the share of manufacturing in aggregate GVA at current prices has not increased in India in the post-reform period. Next, some explanation is given for the difference in the trends observed in the manufacturing GVA share between single-deflated GVA and double-deflated GVA.

### *6.1. Explaining the stagnancy of the manufacturing GVA share at current prices*

- Over time, manufacturing firms in India have outsourced services that were earlier sourced in-house. The value-added content of these services, which was a part of the value added in the manufacturing sector, shifted over time to be counted in the services sector.[14]
- In the course of the last two decades, Indian manufacturing has become increasingly involved in the global value chains (GVCs). However, the involvement has often been in those segments of the value chains where value generation is low because of intense competition from other emerging economies offering to undertake such manufacturing activities. As regards the parts of the value chains with high value generation, these are generally with foreign multinational firms who appropriate those values. This might have led to increased GVC-related manufacturing activity in India without commensurate domestic value generation.
- Dutta (2019) has investigated why the manufacturing sector has lagged behind services in terms of GDP share. He notes that the stagnant GDP share of manufacturing and increasing share of services is attributable to the fact that the relative prices have moved against the manufacturing sector. He observes that the apparent stagnancy of manufacturing GDP share conceals the vibrant growth

[14] The point about splintering has already been recognised in the literature. Gordon and Gupta (2004, pp. 11-12) observe that the use of services in industry increased by 40 percent between 1979-80 and 1993-94. See, in this context, Banga and Goldar (2007).

of output of the sector with slippage of value added taking place through a decline in relative price (p. 86).

- There is a need to recognize that the income elasticity of demand is likely to be greater for services than for manufacturing, and therefore, as incomes in India rise, prices for services will increase more (or reduce less) than prices for manufacturing goods. This factor could be behind lowering the relative price of manufactured goods. It seems to us, however, that the fall in the relative price of manufacturing vis-à-vis services in India has a lot to do with the trade reforms in India in the 1990s and the early 2000s. Before the onset of the trade and other economic reforms in India, the tariff rates on industrial goods were very high (Nauroz, 2001; Panagariya, 2004; Das, 2016; Singh, 2017, among others). There was an escalated tariff structure (higher tariff at higher levels of processing), and tariff reforms were undertaken by a gradual compression of the top tariff rates (Panagariya, 2004; Singh, 2017). A reduction in industrial tariffs caused the prices of industrial goods to decline relative to the prices of non-traded sectors.
- Tariff reforms in the 1990s and 2000s reduced substantially the effective rate of protection (ERP) enjoyed by Indian manufacturing (see Ahluwalia, 2006; Das, 2016, among others). There was probably no such reduction in the effective rate of protection enjoyed by the services sector. These differences in trends in the effective rates of protection in manufacturing and services might have caused the relative shares of manufacturing and services in the current price GVA to tilt in favour of services and against manufacturing.

### 6.2. *Explaining why the double-deflation method shows a rising manufacturing GVA share*

While the movement in the relative price against manufacturing vis-à-vis services explains to a large extent the stagnancy of manufacturing GVA share at current prices, this phenomenon does not explain why the share is stagnant in GVA data at constant prices in the national accounts (see Fig. 1). The explanation mainly lies in the fact that constant price GVA data of the national accounts are based on the single deflation procedure, and this may not capture the true growth in real value added when the pace of change in the output prices and that of intermediate inputs are divergent. The bias in single deflated GVA caused by differences in the rate of growth in output price and intermediate input price has been noted in the literature (for example, Balakrishnan and Pushpangadan, 1994). In this context, the following two points may be noted.

- The growth rate in energy prices in the 1990s was faster than that in manufacturing product prices, and this did not get corrected later (Table 3). Thus, the increased energy cost was absorbed as reduced GVA (maybe, to some extent). This divergence in price movements does not get corrected in the measurement of real GVA if the single deflation procedure is applied and tends to depress the manufacturing share in GDP. A proper correction needs the application of the double-deflation procedure. Also, Fig. D.1 in Annex-D shows that during 2004-2019, the growth in the prices of certain intermediate inputs in manufacturing grew much faster than that in the prices of manufactured products.

**Table 3**
Implicit deflators, manufacturing sector output and energy input (1993-94 = 1.0).

| | 1993-94 | 1999-2000 | 2004-05 | 2009-10 | 2014-15 | 2019-20 |
|---|---|---|---|---|---|---|
| Output deflator | 1.00 | 1.41 | 1.87 | 2.40 | 3.00 | 2.95 |
| Energy input deflator | 1.00 | 1.69 | 2.33 | 2.88 | 3.90 | 3.95 |

Source: Author's computations based on India KLEMS database (version 2022)

- A similar issue exists with the deflation of GVA of the Coke and petroleum products industry (dominated by petroleum refining). The prices of materials (mainly crude oil prices, domestic and imported) have grown much faster than the price realized for output (Fig. 3). This difference in price movements has a strong effect because the cost of materials is commonly about 80 per cent of the value of output (relatively high). These two factors cause a significant downward bias in estimated real GVA growth when the single deflation procedure is used, which gets corrected when the double deflation procedure is applied. Drawing on the results of the analysis based on the Tornqvist index presented above, which shows that the Coke and petroleum product industry contributed to nearly two-thirds of the manufacturing sector growth acceleration in the post-2003 period, it may be argued that the relatively slower increase in the prices of petroleum products in comparison to the rate of increase in prices of crude oil and other materials used in petroleum refining is a prime cause of the divergence between the manufacturing GVA share based on single deflation and that based on double deflation.

## 7. Premature deindustrialization

As a follow-up to the above discussion, it is important to go into the issue of premature deindustrialization, which is relevant to the above analysis. The notion of premature deindustrialization may be explained in the following way. Historically, today's advanced countries had a peak in the manufacturing share in GDP at a particular level of per capita income (see Ghose, 2021). By comparison, in emerging economies, this peak is currently lower and is reaching a lower level of per capita income. Haraguchi, et al. (2016, p. 2) note that premature deindustrialization has recently been increasingly noticeable in developing countries. This has occurred at a lower share of manufacturing in GDP at the peak and it has been reached at a much lower level of income than the early industrializers. Other studies that have dealt with this issue include Dasgupta and Singh (2006), Ghani and O'Connell (2014), Amirapu and Subramanian (2015), and Rodrik (2015). [15][16]

An important question that may be raised here in the context of the Indian economy is whether the peak to be considered is in the nominal or real share in GDP. It has been shown in the analysis above that while the nominal share in GDP had reached a plateau a couple of decades ago, the real share of manufacturing has not reached its peak in India so far – this is the impression one would gather from Fig. 2 given above.

The paper by Amirapu and Subramanian (2015) requires a more detailed discussion here since they have carefully examined the issue of premature deindustrialization in the Indian context. They consider the share of organized manufacturing (based on ASI data) in total value added. Measured at current prices, they find that the share is stagnant. Even at constant prices, they find the share of manufacturing in aggregate GVA is stagnant (Fig. 2 of their paper on page 43). Since they do not mention using double deflation, it appears that they have applied single

[15] For discussion on pre-mature deindustrialization in the Indian context, see, Amirapu and Subramanian (2014), Chaudhuri (2015) and Kumar (2018).

[16] A critical review of the literature relating to premature deindustrialization is available in Ghose (2021). He observes that the narrative of premature deindustrialization is based on empirical evidence rather than theoretical reasoning. On the impact of labour productivity growth in manufacturing on the share of this sector in employment, he points out that if the relative prices of manufactured products decline vis-à-vis the products of agriculture and services, then this may boost the output of manufacturing and thus lead to increased employment. This comment about the decline in the relative prices of manufactured products is connected with the observation made earlier in this paper that due to a divergence between the movements in the volume and price dimensions of manufacturing value added, there may be a stagnation of manufacturing share in GDP at current prices even though the real share of manufacturing is increasing.

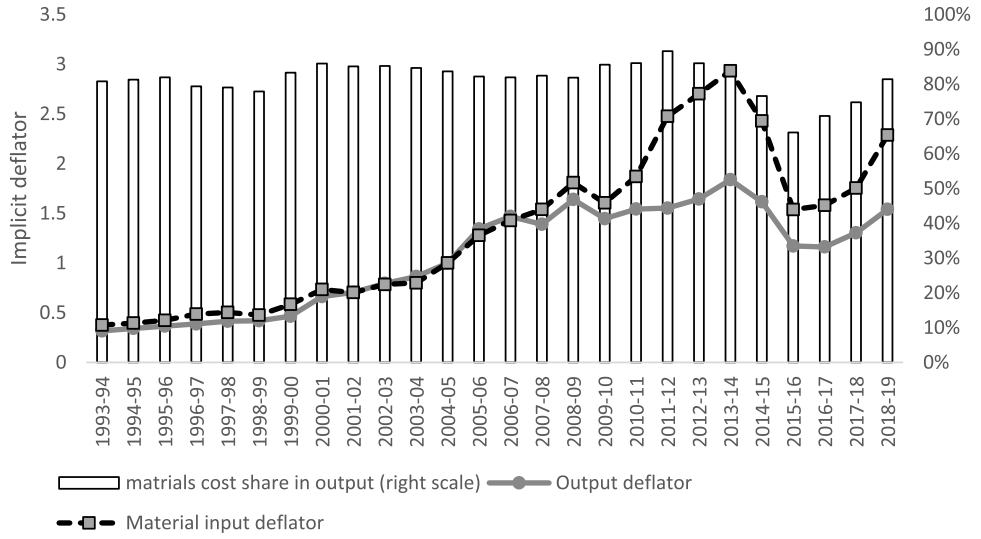


**Fig. 3.** Implicit deflator for gross output and materials input, Coke and Petroleum Products Industry (2004-05 = 1.0).
Source: Authors' computations based on India KLEMS database (version 2022).

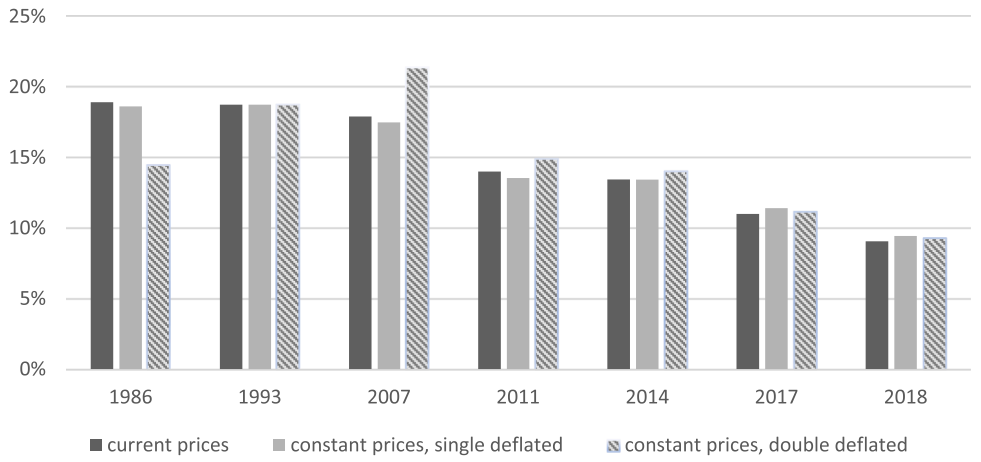


**Fig. 4.** Share of organized manufactruring in gross state domestic product, Maharashtra.
Source and note: Computed by the authors. Data sources are mentioned in Annex-C.

deflation. Hence, the finding that the share of organized manufacturing in total GVA in India is virtually stagnant at both current prices and constant prices based on single deflation matches the trend depicted in Fig. 1 given at the beginning of this paper.

Amirapu and Subramanian (2015) have presented a state-wise analysis of the trends in manufacturing share in total GVA and have reported the year when each of the states in India reached its peak share of organized manufacturing in total GVA (Table IIA of their paper). In this analysis, they have used the GVA share at current prices. To give some examples, they report that Maharashtra reached its peak organized manufacturing value-added share in 1986, and Uttar Pradesh did so in 1996. At the All-India level, the peak was reached in 2008.

Since Maharashtra is one of the top industrialized states in India[17] and the share of organized manufacturing in total GVA in this state at current prices peaked more than four decades ago, it would be interesting to compute the GVA share of organized manufacturing at constant prices based on double deflation and look at the trends in the GVA share of manufacturing. This is presented in Fig. 4 for select years. The share has been computed for organized manufacturing. Along with the share obtained by applying double deflation, the share at current prices and the share obtained by applying single deflation are shown in the figure (some computational details are provided in Annex-C).

It is seen in the figure that the share of organized manufacturing in total GVA in Maharashtra had peaked in 1986 (as reported by Amirapu and Subramanian, 2015) if one considers the shares measured at current prices or at constant prices by applying single deflation. However, when double deflation is applied, the share of manufacturing in total GVA in the state did not peak in 1986. Instead, there was an increase between 1986 and 2007, and only after 2007 was there a fall in the share. If the year of the peaking of the share is taken as 1986, then this transition took place at the per capita gross state domestic product of about US$ 1400 (measured in 2005 purchasing power parity dollars). But, if the transition in India's leading industrialized state, Maharashtra, occurred in 2007, the level of per capita gross domestic product in that year was about US$ 4500 (at 2005 purchasing parity dollars).

Considering the above-described example on the GVA share of manufacturing in Maharashtra and the trends in the GVA share of manufacturing at the aggregate economy level depicted in Fig. 2, it may be concluded that while in some states of India, the peak GVA share of manufacturing might have been reached already, there are many other

[17] In 2018-19, Maharashtra ranked first among the states in terms gross value added in organized manufacturing.

states in which the share of manufacturing in aggregate GVA of the state is on the rise with the consequence that for the economy as a whole there is an upward trend in the share of manufacturing in aggregate GVA. This is the inference that would be drawn when the double deflation method is applied for price corrections. Also, from the analysis above, it appears that as for those states in which the transition has already taken place, it has probably taken place at a relatively much higher level of per capita income than what one would surmise based on the trends in the manufacturing GVA share computed at current prices or using single deflated GVA.

## 8. Concluding remarks

Contrary to a widely held impression that the share of manufacturing in India's GDP has stagnated for a long time, the paper has presented an alternate set of estimates of real GVA based on a more appropriate methodology which indicate that the share of manufacturing has increased during the post-reform period. Measured at 2004-05 prices, the GVA share of manufacturing increased from about 17 per cent in 1993-94 to about 32 per cent in 2018-19 (between 2003-04 and 2018-19, the manufacturing share in aggregate GVA increased from 16 per cent to 32 per cent). This increase is found when output and intermediate inputs of manufacturing are deflated properly (using the double deflation method). The same conclusion, i.e., a growing GVA share of manufacturing, was reached when the Tornqvist index of GVA growth was used for the analysis. The analysis based on the Tornqvist index showed that the hike in the GVA share of manufacturing during 2003-2019 is attributable in the main to an accelerated growth in the Coke and Petroleum products industry.

Analyzing the share of manufacturing in aggregate GVA of the economy since the early 1950s (see Annex-B), it is found that there was an upward trend from the early 1950s to the end of the 1970s. The analysis in Section 4 of the paper indicated that there was an upward trend in the share from 2003-04 to 2018-19. Thus, there were two phases in the post-independence period when the manufacturing sector's share in aggregate GVA increased.

While the paper focused on the share of manufacturing in aggregate GVA and whether it has increased over time, a brief discussion on the trends in the share of manufacturing in aggregate employment will perhaps not be out of place here. There is a widely held view that the share of manufacturing in aggregate employment in India has been stagnant or virtually stagnant. In a recent paper, Goldar (2023) has looked closely at the trends in manufacturing share in aggregate employment in India. The analysis reveals that the share of manufacturing in employment is not stagnant but growing slowly. Making a comparison of India with eight emerging economies of Asia, it is found that India's performance in regard to the increase in the manufacturing share in aggregate employment between 2000 and 2021 has been better than that of six Asian emerging economies out of the eight considered for comparison. Another study finding is that the organized manufacturing sector has done well regarding job creation. Since 2004-05, employment in organized manufacturing has grown at the rate of 4-5% per annum, well above the growth rate of the total workforce. This has made shifts of industrial workers from unorganized manufacturing to organized manufacturing possible, enhancing their productivity and wages.

## Data availability

Most of the data used is shareable. But, some cannot be shared

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## Annex A: India KLEMS database

The India KLEMS database provides annual time series data on output, inputs, factor income shares, and productivity for 27 industries that constitute the total economy (for details, see India KLEMS Data manual). Of the 27 industries, 13 belong to manufacturing. The series on employment and labour quality are provided, along with the series on capital stock and capital input which is based on the concept of capital service. The latest database (at the time of writing this paper) provides these series from 1980-81 to 2019-20.

The India KLEMS database is based primarily on *National Accounts Statistics* (NAS) (National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India). The industry-level series on gross output, value added, and three intermediate inputs, namely materials, energy, and services, at current and constant (2011-12) prices (which are relevant for the analysis in the present paper), are prepared on the basis of the NAS (series with base 2011-12, and the corresponding back series). Other data sources used for preparing the industry-level data series on output, value added and intermediate inputs include Input-Output transactions tables, Supply-Use tables, various rounds of *Annual Survey of Industries* (ASI), and surveys on the unorganized manufacturing sector undertaken by the National Sample Survey Office (NSSO). Capital inpus series is based on NAS and labour input series is prepared on the basis of Employment-Unemployment Survey of the NSSO and the more recent Periodic Labour Force Survey.

Since the output, value added, and intermediate input series are provided for 27 industries at current and constant (2011-12) prices and the deflator used are also provided in the database (implicit deflator for gross output and GVA can be computed), it is possible to measure the gross value added, single or double deflated at the prices any of the years during 1980-81 to 2019-20 by changing the base year of the deflators.

## Annex-B. Long-term trends in the share of manufacturing in aggregate GVA

Fig. B.1 shows the share of manufacturing in the aggregate GVA of the Indian economy during 1952-53 to 2004-05. Data on GVA of manufacturing and the aggregate economy at current prices and at 2011-12 prices have been obtained from the NAS with base 2011-12 and its back series. The base of the implicit deflator has been changed to 1981-82, and then the share of manufacturing in aggregate GVA at constant prices has been computed.

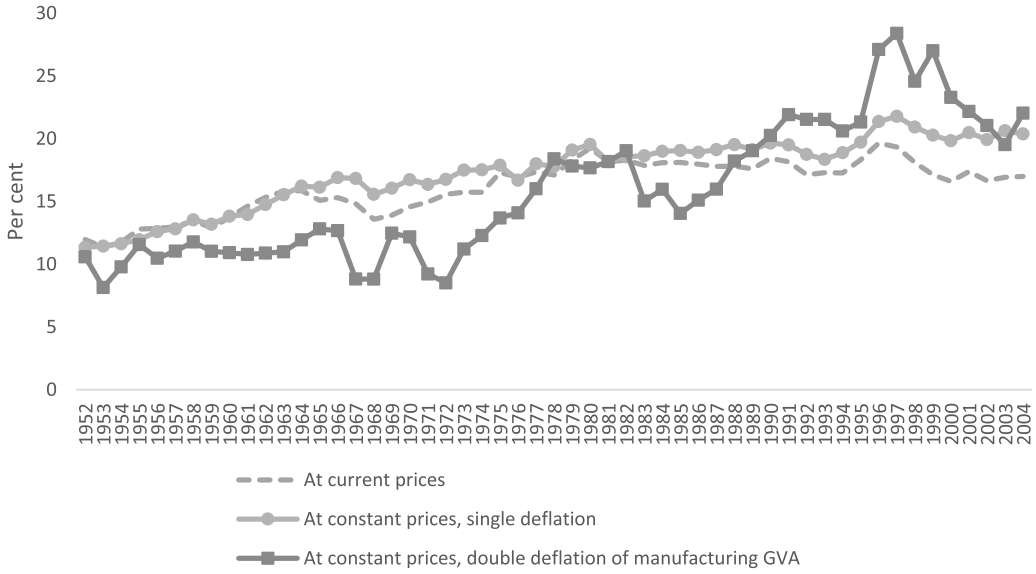


**Fig. B.1.** Share of manufacturing in aggregate GVA of the Indian economy, 1952-53 to 2004-05.
Source and note: Authors' computations using data as explained in the text. The constant price series are at 1981-82 prices.

The figure also shows the GVA share of the manufacturing sector at 1981-82 prices when the double deflation procedure is adopted. The computation of double-deflated GVA of manufacturing necessitated several approximations to be made. The KLEMS database mentioned in Annex-A has been used to obtain a series on gross output of manufacturing and total intermediate inputs at current prices from 1980-81 to 2004-05. These series have been extended backward till 1952-53. For this purpose, the NAS series with base 2004-05 and its corresponding back series have been used. From this data source, the gross output to GVA ratio has been computed for registered (organized) manufacturing. This ratio has been applied to the nominal GVA of manufacturing for 1952 to 1980-81 (obtained from the back series of the NAS with base 2011-12), and then splicing has been done.

Using this method, gross output and intermediate input at current prices in manufacturing were computed from 1952-53 to 1979-80. Such estimates for 1980-81 to 2004-05 are obtained from the India KLELMS database. For the period 1980-81 to 2004-05, the deflators for gross output and intermediate input of manufacturing are available in the India KLEMS database. These deflators have been extended backward till 1952-53 by extrapolation with the help of a price index of output and a price index for materials, power, and fuel taken from Balakrishnan and Pushpangadan (1994).

It is seen in Fig. B.1 that there was an upward trend in the share of manufacturing in aggregate GVA in the period from the early 1950s to the end of 1970s. An increase is seen for all three series shown in the figure. During the 1980s and 1990s, and the early years of the 2000s, there was no increase in the share of manufacturing in aggregate GVA. Fig. 2 presented in Section 3 of the paper indicated that there was an upward trend in the share of manufacturing in aggregate GVA after 2003-04. Thus, from the analysis presented in the paper, two phases are identified in which there was a significant upward trend in the manufacturing share in aggregate GVA. These phases are (1) from the early 1950s to the end of the 1970s (this is the initial phase of industrialization in India) and (2) the period after 2003-04.

## Annex-C. Computation of the share of organized manufacturing in total GVA in Maharashtra

- Data on output, intermediate input, and GVA for the factory sector of ASI has been taken from ASI reports. This is treated as GVA in manufacturing. Industry code 40 (electricity), according to NIC 1970 and NIC 1987, has been excluded from the data for the years before 1998 because this industry has been mostly removed in ASI data collection from 1998 onward. For the inter-temporal comparability of data, this is necessary. The factory sector is dominated by manufacturing but also has some non-manufacturing industries.
- Data on gross state domestic product (GSDP), the measure of total GVA at the state level, have been taken from the website of the Ministry of Statistics and Programme Implementation, Government of India, and from the *Handbook of Statistics on Indian States*, Reserve Bank of India. These sources have been used to obtain GSDP at current prices and 1993 prices (through splicing).
- To obtain double-deflated GSDP, the ratio of double-deflated GVA for the Indian economy to GVA at current prices has been computed, and then this ratio has been applied to the GDSP at current prices series for Maharashtra.
- To compute the single deflated organized manufacturing GVA for Maharashtra, the implicit deflator for manufacturing at the All-India level has been applied.
- Output and intermediate input have been separately deflated to compute double-deflated organized manufacturing GVA for Maharashtra. From the India KLEMS dataset, implicit deflators have been computed for each of the 13 manufacturing industries in the database. In the same way, the implicit deflator for intermediate inputs has been computed for each of the 13 manufacturing industries. The base of the price indices has been shifted to 1993-94. Then, weighted averages of the implicit deflators have been taken, for output deflators and implicit deflators for intermediate inputs, by considering the industry composition of manufacturing in Maharashtra in 1993-94.

## Annex-D. Additional figures

Figs. D.1 and D.2,

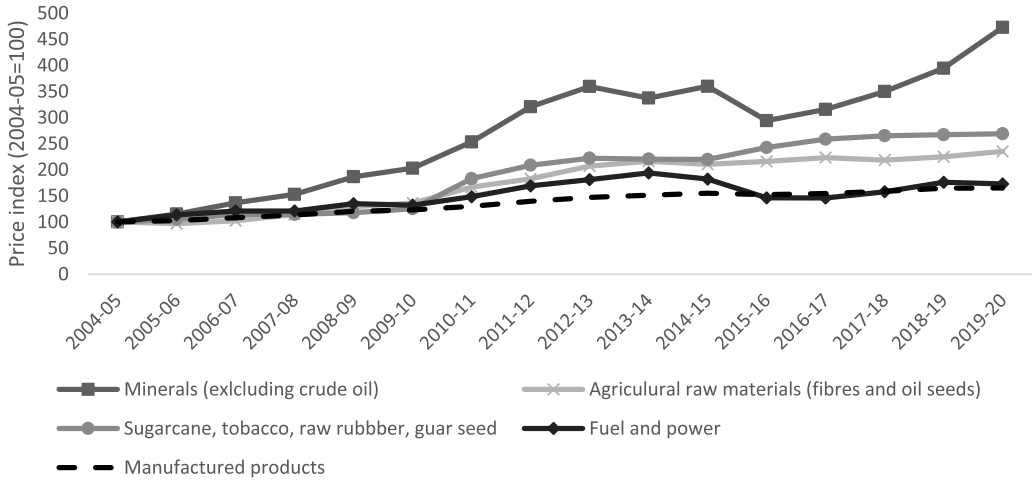


**Fig. D.1.** Trends in Wholesale Price Indices: Manufactured Products and Certain Intermediate Inputs in Manufacturing.
Source and note: Prepared by the authors using the official series on wholesale prices (Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India). The series with base 2011-12 and 2004-05 have been spliced for the graph.

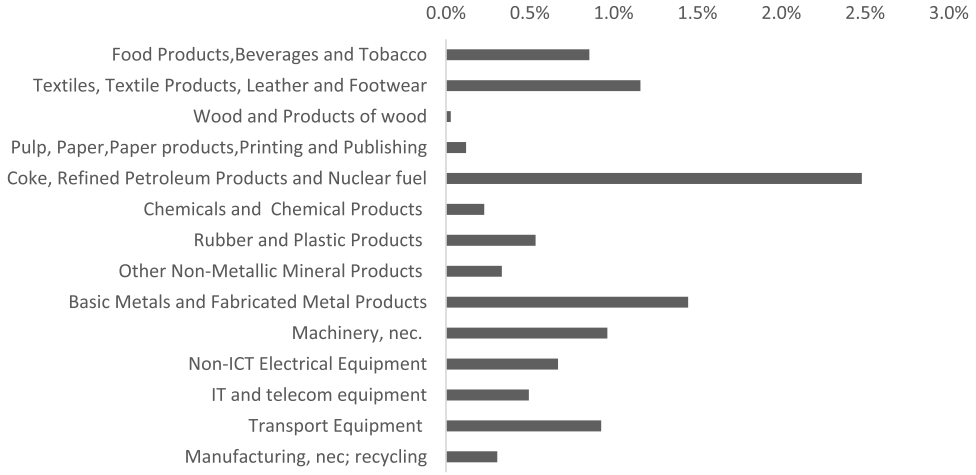


**Fig. D.2.** Industry contributions to aggregate real GVA growth in manufacturing, 2003-2019 (percentage points per annum).
Source: Authors' computations based mainly on India KLEMS database (version 2022).

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